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PERUVIAN BARK

Peruvian Bark: a Popular Account of the Introduction of Chinchona Cultivation into British India. By Clements R. Markham, C.B., F.R.S. 1860–1880. (London: John Murray, 1880.)

"THE enterprise undertaken by me in 1859 of introducing the cultivation of Peruvian bark trees into British India and Ceylon is now an assured success." With these words Mr. Markham begins his preface, and a perusal of the convenient history he has put together of the gradual steps by which during the past twenty years this success has been reached, enables us to fully share the satisfaction with which they must have been written. Not merely has a cheap supply of febrifuge alkaloids been brought within reach of the fever-haunted population of India, but a new and highly-profitable industry has been opened to the planters of our tropical colonies, and the yield of an inestimable drug placed beyond risk of exhaustion.

Enthusiasm is in most enterprises essential to success. If a certain tinge of impracticability often accompanies it a moderate experience of human nature disposes us to regard this with a good deal of toleration. We may as well confess at once therefore that the pleasure with which we have studied Mr. Markham's pages would have been greater but for his insistance throughout on two grievances, in neither of which do we find ourselves in any way persuaded by his advocacy. One of these—the other is more serious, and must be adverted to further on—is irritating in inverse proportion to its importance. The names of genera employed in systematic botany are Latinised forms, very arbitrary, and often, it must be allowed, unscholarly in their construction. But they are symbols or dockets under which scientific information can be arranged. If there is one thing about which botanists, of whatever nationality, are agreed, it is that the docket, having once been promulgated and brought into use, shall not be meddled with. It may be abolished or merged in some other, but being a mere symbol it cannot be tampered with without disturbing all kinds of mechanical aids to study, such as indexes and catalogues, and so adding to the worry of life. From a literary point of view the correction of *Cinchona* into *Chinchona* may be desirable, but the trouble of having two spellings in circulation is too great a price to pay for the mere satisfaction of literary propriety. It cannot be said therefore that this is merely a literary question like such spellings as those of diocess and chymistry affected by the *Times*, while from a technical point of view it has been already discussed and conclusively decided against Mr. Markham in the pages of this journal.

The genus *Cinchona*—as we must still beg leave to call it—includes all the plants at present known to yield quinine and allied alkaloids. It has rather more than thirty species, some of which however are medicinally valueless, while the rest vary individually in the amount and character of the alkaloids they yield. The native habitat of the genus is very restricted; it is only found on the Andes between 10° N. and 19° S. lat., and between 2500 and 9000 feet of elevation. Besides this the several species are closely limited to particular portions of the general area.

The native inhabitants seem to have set little store on the febrifugal properties of the cinchonas, and indeed to have been little aware of them except in the neighbourhood of Loxa, where a Jesuit was cured in 1600 of a fever at Malacotas by Peruvian bark, and to this day the local prejudice against its use is very strong. In 1638, however, the Countess of Chinchon, wife of the Viceroy of Peru, was cured of intermittent fever by bark sent by the Corregidor of Loxa. The remedy, whose reputation was now established, was carried by her to Spain in 1640, and became known as *Pulvis comitissæ*. In 1670 it was sent to Rome by the Jesuits and distributed to members of that order throughout Europe. Hence it came to be called Jesuit's bark, and it is interesting to find that its merits became accordingly a party question between Protestants and Catholics.

For more than a century (till 1776) the only bark met with in commerce was that brought from the neighbourhood of Loxa. This was called Quinquina, from the Indian name *quina-quina*, *quina* meaning bark, and the reduplication the possession of medicinal properties. The plant producing the bark was described by Linnæus under the name of *Cinchona officinalis*, to be rechristened afterwards by Humboldt and Bonpland *Cinchona condaminea*, a change correctly rejected by Mr. Markham, following Sir Joseph Hooker, and, be it remarked, on precisely the same grounds as those on which the rechristening of the genus as *Chinchona* must also be rejected.

As early as 1735 Ulloa represented to the Spanish Government that the Loxa forests could not long survive the reckless treatment to which even then they were subjected. And this was in spite of the intelligent efforts of the Jesuits, who endeavoured to enforce replanting as a religious duty. The Loxa bark, eventually distinguished as Crown bark from being reserved, when other kinds became known, for use in the Royal Pharmacy at Madrid, is represented in old collections of Materia Medica, such as that of the College of Physicians, by massive fragments which must have been detached from very old trees. Mr. Markham tells us that it is now only found in commerce in the minutest quills. As the Loxa bark became scarce the search after other supplies of cinchona bark was stimulated. The botanical expedition of Ruiz and Pavon sent by the Spanish Government in 1777 resulted in the discovery of seven species of *Cinchona*, yielding gre bark, near Huanuco in Northern Peru. Mutis, another Spanish botanist, believed that he first detected a *Cinchona* in Columbia in 1772, though a resident in Bogota challenged his claim to priority.

The well-known "red bark" of the slopes of Chimborazo seems to have been known early in the last century, and later to have found its way into European markets, though it was not till 1857 that the plant yielding it was clearly identified by Dr. Klotzsch. The yellow or Calisaya barks of Bolivia, first discovered by Haenke in 1776, did not become of commercial importance till 1820, when quinine, the most important active principle of Peruvian bark having been isolated by the French chemists, Pelletier and Caventou, yellow bark was recognised as richer in it than any other kind.

It is not necessary to follow in detail the interesting account given by Mr. Markham of the recklessness with which the natural supplies of Cinchona bark were drawn upon. The inconvenience of a precarious dependence upon the South American forests has for at least forty years occupied the attention of scientific men in Europe. Royle, in 1839, urged the introduction of Cinchonas into India, and pointed out the Nilgiri Hills as a suitable locality. The Dutch botanists had been no less urgent that the experiment should be made in Java, and Hasskarl was commissioned to proceed to Peru in 1852 to obtain seeds. In this he succeeded, but the bulk of the seeds eventually proved to belong to a species worthless medicinally, which was afterwards named *C. Pahudiana.* He also obtained, by the aid of a Bolivian named Henriquez, 400 plants of the yellow bark, *C. Calisaya*, only two of which unfortunately survived in Java. The mishaps of the Dutch enterprise cannot be followed here, instructive as they are to any one interested in the cultivation. A happy accident, to be presently alluded to, was a kind and well-deserved turn of fortune in its favour, and a greater measure of success than could ever have been hoped for now seems assured to it..

The Government of India in 1852 first proposed the introduction of cinchona into that country, and several abortive attempts to effect it were made with the aid of the Foreign Office, but without success. In 1859 Mr. Markham was officially employed by the present Lord Derby, who was then Secretary of State for India, to undertake a mission to South America for the purpose. His previous travels in the Cinchona region, though for ethnological and not for botanical inquiry, and his knowledge of the Spanish and Quichua languages singularly fitted him for the task. The plan laid down by him was extremely comprehensive, and has at last been fully carried out, or nearly so. It was nothing less than the introduction into India of all the species of *Cinchona* yielding bark of known commercial value. This plan was adopted as it was *à priori* uncertain which kinds would turn out best adapted for Indian cultivation, and it was desirable that all should be tried; it involved no less than five distinct expeditions to the different districts of the Andes already mentioned.

Mr. Markham visited himself in 1860 the yellow bark region in Southern Peru and Bolivia, accompanied by a young gardener named John Weir, recommended by Messrs. Veitch. The plants collected reached England in fifteen Wardian cases, but the heat of the Red Sea was fatal to them and they all eventually died. A supply of seed which Mr. Markham had arranged for at Caravaya arrived in India in 1865 and germinated satisfactorily.

Mr. Pritchett, who had travelled in the Huanuco district, was employed to make a collection of the grey bark plants, and to these also the Red Sea was fatal, but the loss again was retrieved by the safe transmission to India of seed which grew well. The red bark region was visited, at the suggestion of Sir William Hooker, by the well-known botanical traveller, Dr. Spruce, who was residing in South America at the time, and he was accompanied by Robert Cross, a Scotch gardener, recommended by the Kew authorities. The plants collected by Dr. Spruce were more fortunate, and reached India in good condition in 1861 under Mr. Cross's charge. This skilful collector then returned to South America and obtained the seed of the crown bark from the Loxa forests, which reached India in 1862 and germinated abundantly. Before returning to Europe he visited the Columbian forests in 1863 and secured seed of Pitayo bark (*C. Pitayensis*), which however had lost its vitality before it arrived in India. He was therefore sent again in 1868, and this time secured both plants and seeds, which were transmitted to India in a living state. The only remaining kinds of importance which had not been introduced into India were the Calisaya de Santa Fé, yielding soft Columbian bark, and *Cinchona cordifolia*, yielding hard Carthagena bark; to procure these Mr. Cross was despatched on another mission, from which he returned in 1878, bringing cuttings of both kinds, and these were successfully propagated at Kew, which had indeed in every case been made the depôt for the receipt of the successive consignments and their despatch to India. The Carthagena bark is now well established in India, Jamaica, and it is hoped in Ceylon. But the fate of the Calisaya de Santa Fé is still doubtful, as one consignment succumbed to the heat of the Red Sea, which is so great an obstacle to the transport of plants, intolerant of great heat, and no news as to the second instalment taken out in charge of Mr. Cross has yet reached this country.

We must but very briefly hurry over the interesting pages in which Mr. Markham describes what has been done in India. Red bark has everywhere taken the lead. Next to this, in the Nilgiris, crown bark has succeeded best; the other kinds have made but little progress. Unfortunately little care seems of late to have been taken in Southern India to keep the different kinds distinct, and as the species hybridise very freely it is not easy to say what some of the plants actually in cultivation precisely are. In the Himalayas, however, besides red and crown bark-plants, *C. Calisaya* (yellow bark) and *C. micrantha* (one of the species yielding grey bark) also do well.

The share taken by Kew in this important enterprise enabled the advantages secured by the Indian Government to be extended to other tropical possessions in the Empire. Sir William Hooker was allowed to transmit a share of the seeds and plants to Ceylon, Jamaica, Trinidad, Mauritius, and St. Helena. In the three latter islands the cultivation has made but little progress; in the first it is now one of the staple resources of the planters; while in Jamaica the crown and red bark bring in an annual revenue to the Government, which leaves an ample surplus after paying the whole expenses of the botanical department.

One of the most singular incidents in the whole story has still to be told. Mr. Charles Ledger, who had long resided in South America, hearing of Mr. Markham's enterprise, employed a native servant, Manuel Mamani, to collect seed of the best Calisaya or yellow bark tree. Four years elapsed before he succeeded, as each year the blossom of the trees was destroyed by frost. These seeds were transmitted to London to the care of Mr. Ledger's brother, and it is believed were offered to the Indian Government, who refused to purchase them. Half was eventually sold to the Dutch Government and half to Mr. Money, a planter on the Nilgiris. This fortunate purchase has put quite a new face upon the cultivation in Java. The bark of some of the trees has yielded as much as 10 per cent. of quinine; and the news of this remarkable result has produced much the same effect on Cinchona planters in Ceylon and Southern India as the discovery of a gold-field on the inhabitants of an Australian city. The Java officials have however behaved with singular liberality in the matter, and in the course of a few years it cannot be doubted that Ceylon will be abundantly supplied with this valuable kind, which, there seems reason to think, may prove to be a distinct species. Part of the seed sent in the first instance to the Nilgiris seems to have found its way to Sikkim, and the Government plantations there are believed to be in possession of a strain of Calisaya, little if at all inferior to that possessed by the Dutch.

The Government of Bengal have effected an enormous saving by using, in hospitals and dispensaries, instead of quinine imported from Europe, the febrifuge manufactured at the Sikkim plantations. The Government estimated that in consequence, by the end of 1879, "the plantations will have cleared off the entire capital that has been invested in them."

And this leads us to what is really the painful feature in Mr. Markham's book. He complains in repeated and in bitter terms of the want of justice which has been shown to those whom he employed in the business of collecting. "Those who did the work have not received fair recompense for most valuable services." It is rather singular to find that he adduces in support of this statement the case of Mr. Ledger, who was not even in any way commissioned to do what he did. But the remuneration which his actual agents received was the ground of no complaint on their part, and was in point of fact liberal compared with that which is given to the collectors who are constantly employed by the great nurserymen, and who too often lose their lives in their arduous pursuits without the satisfaction of feeling that they are doing so in an enterprise like this of lasting utility. But we fear that if Mr. Markham's assistants have reason to complain the blame must, on his own showing, be laid at his own door. He tells us (p. 271): "The system I adopted was . . . to include very slight remuneration in the original agreements. *Thus the loss to Government would be insignificant if the work was not executed satisfactorily*. If, on the other hand, the arduous tasks were successfully performed . . . I anticipated no difficulty in obtaining fitting recognition for such distinguished services." We leave our readers to judge of the probability of such a scheme answering Mr. Markham's expectations. We may go further, and ask how the claims would have stood if, notwithstanding all the pains that were taken, the cultivation of Cinchonas had fared in India—as might even have happened—no better than it at first did in Java.

But there are many other things pleasanter than this which we should like to touch upon if this review had not already run to an inordinate length. So many Englishmen are now in one way or other interested in colonial industries that it will be strange if this interesting book does not find as many readers as it deserves. Besides a complete history of the Cinchona enterprise in the Old World, it gives, in an appendix, accounts of some other South American vegetable products, notably india-rubber. The steps taken at Mr. Markham's instance for the introduction into India of the most important rubber-yielding plants of the New World have been from time to time recorded in our pages. We have only to repair one inadvertent omission on Mr. Markham's part, and point out that the transmission of the Para rubber plant to India was secured by the exertions of Mr. Wickham, as recorded in the Kew Report for 1876, p. 8.

PRACTICAL BLOWPIPE ASSAYING

Practical Blowpipe Assaying. By George Attwood. With Seventy-four Woodcuts. (London: Sampson Low, Marston, Searle, and Rivington, 1880.)

THIS book shows many signs of carelessness on the part of the author. At the very outset, in the Introduction, we meet with strange statements. Mr. Attwood divides the elements into those which are of commercial value and those which are of no commercial value. In the latter class we find Uranium and Tungsten; surely the author does not intend to deny the value of pitchblende and wolfram. He classifies zirconium among the non-metallic elements.

The first part of the work describes the reagents and apparatus; the second, we are told, contains the modes of determining any one of the sixty-four well-recognised elements, and in the third part we have the methods adopted by the author for making quantitative assays by the blowpipe. Finally, Part IV. contains some tables showing the English and American values of gold according to its fineness, and the value of gold coins in the United States.

The apparatus employed is much the same as that recommended by Plattner. Like Neumann, Mr. Attwood very wisely uses riders with his balance instead of the very small weights supplied by some of the other Freiberg opticians; but the balance would be improved by the addition of a movable arm for shifting these riders. The steelyard devised by the author will probably be of use to explorers. From practical experience with the batea I can fully endorse all that is said in its favour, but why are the merits of the iron pan ignored? It has the advantage that it will stand rougher usage than the batea. Again, for washing a sample of tin ore nothing will beat the Cornish vanning shovel.

I regret to see no mention of the useful little pastilles and crucibles made out of charcoal powder, proposed by Griffin thirty or forty years ago and adopted by Plattner. Col. Ross's aluminium plate for sublimates seems also to have escaped Mr. Attwood's notice.

With reference to the list of reagents I must remark that the author does not name all the reagents which his tests require, whilst others are inserted which he does not appear to put to any use. I should be glad to know what he means by inserting "nitrous acid" among his reagents. This is not a misprint for "nitric acid," because that acid has been already named.

The plan of the second part of the work is not one which I should recommend. It simply contains a list of tests for the various elements, but gives no systematic scheme for making the examination of an unknown substance. I fear that the "direct" method advocated by Mr. Attwood will often prove a very tedious one. Many of the tests themselves are not so complete as they